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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/702,238 | 11/06/2003 | Bradley J. Howard | 97-0008.02 | 7948 |

7590 07/05/2006

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EXAMINER

LEE, SIN J

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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1752

DATE MAILED: 07/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/702,238

Applicant(s)

HOWARD, BRADLEY J.

Examiner

Sin J. Lee

Art Unit

1752

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 55-57, 59-61 and 76-87 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 55-57 is/are allowed.
- 6) ☒ Claim(s) 59-61 and 76-87 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 06 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. In view of the amendment of April 4, 2006, previous 102(e) rejection on claims 56-57 over Naik et al'168 is hereby withdrawn.

Claim Rejections - 35 USC § 102

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. Claims 59-61, 76-78, and 82-87 are rejected under 35 U.S.C. 102(e) as being anticipated by Naik et al (US 6,204,168 B1).

In col.3, lines 16-27, Naik states the following:

To form a single damascene structure, a first layer of low k material is deposited upon a substrate and a layer of PPMS (or another silicon-based resist material) is deposited upon the layer of low k material. The PPMS is then masked and exposed to UV light to form PPMSO at the exposed regions of the mask. A chlorine etch chemistry is used to remove the PPMS and form a patterned layer of PPMSO. The pattern defines locations for vias through the first layer of low k material. An oxygen-based etch chemistry is then used to remove the low k material at the via location. As such, the patterned layer of PPMSO is used as a hard mask during the oxygen-based etch process.

Naik also teaches (col.8, lines 48-53) that the single damascene structure utilizes the PPMSO as an etch stop and a hard mask type material for etching the low k polymers within an oxygen plasma. Since PPMSO is being exposed to the environment of oxygen plasma, it is the Examiner's position that Naik's PPMSO layer would further convert to an oxide layer through the oxygen plasma (present claim language does not exclude present insulative layer being an oxide layer). Since after the chlorine etch process (to remove the non-exposed portions (PPMS), the patterned layer of PPMSO is further converted to the oxide layer through exposure to an oxygen plasma, Naik still

teaches the present claim 76. Therefore, Naik teaches present inventions of claims 76-78, 82 and 83.

With respect to present claims 59-61 and 84-87, those claims are product-by-process claims. "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product *does not depend on its method of production*. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP 2113. Since Naik teaches (col.3, lines 28-30) that a metallization layer is deposited over the via pattern and the layer is planarized such that only the via is filled with metallization, Naik teaches present feature of claim 59 and present conductive layer inlaid within the patterned oxide layer of claim 84. Therefore, Naik teaches present invention of claim 59 (which only requires the presence of a substrate, at least one feature, and an oxide layer) and present invention of claim 84 (which only requires the presence of a substrate, a patterned oxide layer and a conductive layer inlaid within the patterned oxide layer). Therefore, the prior art teaches present inventions of claims 59-61 and 84-87.

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 79-81 are rejected under 35 U.S.C. 103(a) as being unpatentable over Naik et al (US 6,204,168 B1) in view of Weidman et al (5,885,751).

As described above in Paragraph 3, Naik etches the low k polymers within an *oxygen plasma* (by which Naik's PPMSO will convert to oxide). Although Naik does not explicitly mention "annealing", it is very well known in the art, as evidenced by Weidman, col.1, lines 12-38, to oxidize *and anneal* the PPMSO pattern to convert it to a hard oxide suitable for further processing (such as deposition or etching steps). Therefore, it would have been obvious to one skilled in the art to oxidize and anneal Naik's PPMSO pattern in order to convert it to a hard oxide suitable for further processing. Therefore, Naik in view of Weidman would render obvious present inventions of claims 79-81.

Allowable Subject Matter

6. Claims 55-57 are allowed. The amended claim 55 now requires that the oxide layer *does not form until* after completion of the use of the exposed portions of the photo-definable layer as a patterned etch mask. Since in Naik, the oxide layer forms while using the exposed portions of the photo-definable layer as a patterned etch mask, Naik does not teach present invention of claim 55.

Response to Arguments

7. Applicants argue that each independent claim makes clear that the exposure to an oxygen plasma and conversion to an oxide layer is achieved after *any* etch step such as in Naik. However, in the independent claim 76, the exposure to an oxygen plasma and conversion to an oxide layer is said to occur after *the etch process*, which removes

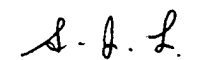
Art Unit: 1752

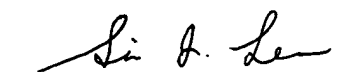
non-exposed portions of the photo-definable layer. As discussed above, since after the chlorine etch process (to remove the non-exposed portions (PPMS), the patterned layer of PPMSO is further converted to the oxide layer through exposure to an oxygen plasma, Naik still teaches the present claim 76. As discussed above, other independent claims 59 and 84 are written in product-by-process claim language, and as already explained above, Naik still teaches present inventions of those claims.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is **571-273-8300**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


S. Lee
June 27, 2005


SIN LEE
PRIMARY EXAMINER